

The Effectiveness of Embedded Teaching through the Most-to-Least Prompting Procedure in Concept Teaching to Children with Autism within Orff-based Music Activities^{*}

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Abstract

The purpose of this study was to demonstrate the effectiveness of embedded teaching through the most-to-least prompting procedure in concept teaching to children with autism in Orff-based music activities. In this research, being one of the single subject research designs, multiple probe design was used. The generalization effect of the research was assessed in the form of a pre-test and post-test, discussing the organization about interpersonal generalization in different environment. The maintenance of learning was checked by means of the observation sessions applied one, two, and four weeks after the practice was completed. The research was conducted with 3 children with autism between the ages of 3-6 in Nova Special Training and Rehabilitation Center in Istanbul. In research process, full probe, daily probe, teaching, observing and generalizing sessions have been organized. All of the sessions were done by one-to-one teaching method. The data of reliability among the observers and of application reliability were collected. According to research results, it was clear that the embedding teaching through the most-to-least prompting in Orff-based music activities is effective to teach concepts to the children with autism. It was understood that the maintenance was kept after the training was completed. It was also clear that the concept which was thought is effective in the generalization of different settings, different people and different materials. Additionally, social validity was verified in research to determine the importance of purposes of research, teaching methods to reach these purposes and research results.

Key Words

Children with Autism, Orff Approach, Embedded Teaching, Most-to-Least Prompting, Concept Teaching.

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Defined as permanent behavioral change arising from experiences in behavior or potential behavior, "learning" occurs through different ways for each person (Senemoğlu, 2007). Special arrangements should be made for teaching children who have special needs. Functional education programs are developed and systematic teaching practices are implemented with regard to teaching of independent life skills to children with developmental disabilities (Eripek, 2005; Kurt, 2009).

According to Special Education Services Regulation of the Ministry of National Education (2011), an individual who needs special education is defined as 'an individual who shows significant difference compared to the level expected from fellows with regard to educational and individual qualifications due to various reasons'. Individual with autism is defined as 'an individual whose restraints in social interaction, verbal and non-verbal communication, as well as interest and activity develop in early childhood period and who need special education and supportive education service due to these restraints' (Milli Eğitim Bakanlığı [MEB], 2012), while autistic disorder is defined as a developmental disorder characterized by incapacity in social interaction, language and communication abilities; restricted, stereotyped and repetitive patterns in behaviors, interest and activities, as well as disorders or extraordinary functionality in at least one of the following: social interaction, language used in social communication, or symbolic/imaginative play abilities, which occur before the age of 3 (Diken, 2008; Kircaali-İftar, 2003; Korkmaz, 2005). In order to offer an efficient education by exploring individual learning methods of children with autism, it is required to organize the physical environment according to their requirements, work on improper behaviors that they exhibit, utilize visual supports and prompts, and to determine the most suitable teaching techniques for them (Korkmaz, 2003).

Used in education of children with autism, 'Applied Behavior Analysis' involves the following steps respectively: determination of current performance of child, identification of fields where child suffers from skill deficits, classifying identified abilities into sub-steps, involving abilities (which are classified into sub-steps) into individual programs, and rewarding positive reactions of child (Darıca, Abidoğlu, & Gümüşçü, 2005). "Errorless Teaching Methods" which are based on Applied Behavior Analysis are one of the systematic teaching applications used for education of children with autism (Kayaoğlu & Görür, 2008).

Errorless teaching is offering the equipment related to target behavior or stimulus (Cipani & Madigan, 1986). The possibility of the student giving a correct response is increased with promptings which are offered during teaching sessions carried out with errorless teaching methods. Students receive more reinforcers for correct responses, therefore the level of incorrect responses is low during teaching session, which results in development of a positive interaction between student and teacher (Weeks & Gaylard-Ross, 1981). Listed among Errorless Teaching Methods, 'teaching through most-to-least prompting' is an efficient method in educating individuals who have autistic features, have developmental retardation or have mental disability at various levels. This method is defined as 'offering prompts by following a prompt hierarchy from prompts which require the most control (least moderate) to prompts which require the least control (most moderate) on body of the individual' (Tekin & Kircaali-İftar, 2001).

In addition to provide information to children with autism, it is also important to ensure that they generalize such information to different people, environments and equipment. Therefore it is found effective to use 'teaching through most-to-least prompting' in conjunction with embedded teaching, which is another teaching method, on generalization of concepts and abilities that children with autism learn. Embedded teaching means embedding teaching applications associated with target behavior into continuing activities. Defined as allowing children implement teaching purposes within an activity or event which remains meaningful and interesting for children even though it is extended, changed or adapted, embedding constitutes the basis of embedded teaching (Kurt, 2009). It is possible to find studies on embedded teaching in the literature. Such studies researched the effectiveness of embedded teaching on different issues including imitation ability, dressing ability, counting ability, ability to read and describe words, teaching of single-stage academic abilities, as well as teaching of chain free time abilities (Daughtery, Grisham-Brown, & Hemmeter, 2001; Kurt, 2009; McDonnell, Johnson, Polychronis, & Riesen, 2002; Riesen, McDonell, Johnson, Polychronis, & Jameson, 2003; Sewell, Collins, Hemmeter, & Schuster, 1998; Venn et al., 1993; Wolery, Anthony, Caldwell, Snyder, & Morgante, 2002). But there is not any concept teaching study among the current limited studies, where 'embedded teaching' is used with "*children with autism*". In addition, there has not been a published study in which music activities

are preferred for 'embedded teaching'. However; music activities can be considered as appropriate activities for embedded teaching method which can be used in concept teaching to children with autism, since musical activities offer important opportunities to allow the children express themselves. Art and music education provides children with attitudes and behaviors just as scientific methods and activities do (Güler, 2008). Furthermore, in addition to extraordinary interest and ability of children with autism towards music, it is also mentioned that music has a calming effect on these children. It is stated that communication through music is far from being boring and that communication becomes easier with tones and rhythm features for such children (Korkmaz, 2005). The number of scientific studies that examine the effect of music on normally developing children and autistic individuals that have various usage means such as "*music education*", "*education with music*" and "*music therapy*" is quite a few compared to interventional studies. Mostly based on case studies and application data, this information requires more scientific studies to ensure that the results gain scientific clarity and validity. Based on this information, it is believed that an education carried out with music –which is not listed among scientific based applications yet but is considered as a promising application – could be a good addition to teaching approaches that are already scientifically proven, which are currently available and which are used in the education of children with autism. At this point, being one of the music teaching methods, Orff-Schulwerk elementary music and movement education can be considered appropriate for such synthesis.

Orff-Schulwerk is a music and movement education approach developed by composer and instructor Carl Orff. This approach covers the use of music, rhythmic studies, movement and dance, visual elements, verbal and non-verbal songs and other elements of language altogether and they are considered as a means to support all of a child's developmental areas (mental, physical, language, communication, social etc.). It is possible to say that studies carried out with the Orff approach show similarity with the theory of multiple intelligences, which claims that teaching does not occur with a single method and that teaching can be more effective and permanent through the feeding of various learning channels. Both of these theories address all of the development fields through joint use of various disciplines. In addition, the Orff approach is based on production and

creation of music (jointly), instead of ability based success anxiety. Therefore it can be considered an appropriate method to work in conjunction with errorless teaching methods; which focus on abilities of individuals, not their faults. In addition, as music works carried out with the Orff approach depart from internal music and natural movements that the child exhibit, and as they allow the children express themselves in a play environment, this approach is considered quite similar to the "Natural Teaching Method". As it is similar to methods used in the education of children with autism and it has supplementary features, it is possible to say that Orff approach is an appropriate approach which can be used for the education of children with autism, in addition to children developing normally. There are positive results available from applications and studies carried out with children who exhibit normal development in and out of our country (Aral, Akyol, & Sığırtaç, 2006; İşin, 2008; Kuşçu, 2010; Libeau-Dow, 2008; Register & Hillard, 2008; Sökezoğlu, 2010; Toksoy & Beşiroğlu, 2006; Uysal, 2009; Womack, 2008; Yücesan, 2008).

In studies which research the use of music for education and treatment purposes with individuals who need special education, effect of music and music therapy was examined on the following: Reducing anxiety levels and stereotypic behaviors of children with autism who suffer from developmental disorder, increasing their communication abilities, improving their abilities of joint attention, imitation and getting in line, improving speaking, language and communication abilities, and reducing problematic behaviors, emotional and behavioral disorders (Azbell & Laking, 2006; Beathard & Krout, 2008; Berraçay, 2008; Caltabiano, 2010; Kissinger & Worley, 2008; Krikeli, Michaidilis, & Kalvdinaou, 2010; Lanovaz, Sladeczek, & Rapp, 2011; Lim, 2007; Orr, Myles, & Carlson, 1998; Sauser & Waller, 2006). However, no study has been found on the effect of Orff approach on teaching concepts and skills to children with autism.

Purpose

In the light of this information, the purpose of this study is to demonstrate the effectiveness of embedded teaching through the most-to-least prompting procedure in concept teaching to the children with autism in Orff-based music activities. In line with this overall purpose, (i) Is the embedded teaching through the most-to-least prompting procedure within Orff-based music activities effective on teaching the targeted concept

to children with autism? (ii) Are the concepts, which are taught with embedded teaching through the most-to-least prompting procedure within Orff-based music activities preserved 1, 2 and 4 weeks after the completion of teaching of children with autism? And (iii) is it possible to generalize concepts (inter-material, inter-personal, inter-media) which are taught to children with autism with embedded teaching through the most-to-least prompting procedure within Orff-based music activities?

Method

Experimental Design

In the study, multiple probe design across subject, one of the single subject research designs, was used to answer the research questions (Kircaali-İftar & Tekin, 1997; Tawny & Gast, 1984). In addition, generalization effect of the study (inter-media, interpersonal and inter-equipment) was analyzed on the basis of pre-test and post-test measures. Maintenance of learning was checked with probe sessions conducted on 1st, 2nd and 4th weeks following the completion of practice. Within scope of the research, three types of data were collected: (i) effectiveness data, (ii) social validity data and (iii) reliability data. Reliability data was gathered in two stages-inter observer and procedural reliability data. Graphical analysis was used to identify the effectiveness of embedded teaching, which is carried out with the method of most-to-least prompting.

Participants

Subjects: 3 participants were participated in this research: a 3 year old girl and two boys aged 4 and a half and 5 and a half; who were diagnosed with autism and Diffused Developmental Disorders (Y.G.B), and who receive educational services at Özel Nova Özel Eğitim ve Rehabilitasyon Merkezi which is controlled by the Ministry of National Education in İstanbul. Prerequisite abilities regarding the participants were determined as: (i) absence of hearing and visual impairment, (ii) being capable of orientating attention to visual and audial stimuli for a period of minimum two minutes, (iii) being capable of following instructions and (iv) being capable of taking turn.

Trainer: Primary author of the research was assigned as the trainer at all sessions except for generalization sessions, during the course of research mentioned in this article. The trainer received undergraduate and graduate education in the field of music education.

Also, the trainer has been a member of Orff-Schulwerk Education and Consulting Center since 2002 and attended various seminars in and out of the country. In addition, the trainer also received International Orff-Schulwerk Trainer of Trainer Certificate. In addition, the trainer participated in courses on teaching to people with mental disabilities, in order to improve her knowledge and experience on special education, teaching methods in special education, single-subject research models and autism. In addition to these courses, the trainer voluntarily worked at a Summer Camp for children with autism. Furthermore, the trainer participated in seminars on Single-Subject Research Models, Use of Applied Behavior Analysis, Concept and Ability Analysis and Concept and Ability Teaching, Development of Abilities to Prepare for Learning, and Inclusion Applications, as well as the conference and study on Orff-Schulwerk's Music Therapy, its Importance on Social Pedagogy and Compliance Pedagogy and Music Therapy in Autism. In addition, she was involved in various studies as the guest student at Music Therapy Master Program of Berlin University of Art.

Setting

Training and probe sessions of the research were carried out in the "group room" within the institution where participants attended. Another room was used for inter-media generalization sessions. There was an observation mirror, U-shaped working table, student and teacher's chair in the room where research was carried out.

Materials

Color (Yellow) Concept Teaching Plan: The researcher prepared a teaching plan consisting of 5 sub-steps and 48 trials in total, which was offered to the participant as embedded into the color (yellow) concept which was prepared in accordance with Orff approach.

Data Collection Tools

Data Collection Form for Probe Sessions: It is the data collection form, which is prepared by the researcher as 5 trial stages for processing responses of the participant at probe sessions (baseline, daily probe, maintenance and generalization).

Training Sessions Procedural Reliability Data Collection Form: It is the data collection form

produced to process the findings from video recordings of which 20% is selected by the observer by means of unbiased assignment with regard to the sessions conducted by the researcher during teaching sessions. In the form, following stages were evaluated: (i) making an explanation regarding the teaching, (ii) catching the attention of the student, (iii) using the materials and activity, (iv) implementing the step within the prompt hierarchy, (v) waiting for response, (vi) offering reinforcer following correct responses

Probe Sessions Procedural Reliability and Inter-observer Reliability Data Collection Forms: Probe sessions procedural reliability data collection form produced to process the findings from video recordings of which 20% is selected by the observer by means of random assignment with regard to the probe sessions. In the form; following steps were evaluated: (i) controlling the materials, (ii) offering the prompt, (iii) offering the instruction, (iv) waiting for response, (v) giving appropriate reaction. When collecting inter-observer reliability data, it was evaluated whether or not correct and incorrect responses of the participant are properly processed in the data collection form by the researcher. Procedural reliability and inter-observer reliability data were calculated by using the following formula: "Consensus / (consensus +dissensus) X 100" (Kırcaali-İftar & Tekin, 1997).

Social Validity Data Collection Form: With the Social Validity Question Form, it was intended to identify the opinions of participants' parents on the research process and "Teaching of concept to children with autism by means of embedded teaching through the most-to-least prompting procedure within Orff-based music activities." Social Validity Question Form includes questions on personal information, in addition to 11 questions - 6 closed end questions and 5 open end questions which were prepared in accordance with Likert three-scale.

Procedure

Dependent variable of this research is the teaching of color (yellow) concept which is among basic concepts, while independent variable is offering the embedded teaching through the most-to-least prompting procedure within Orff-based music activities. Within scope of this study, effect of the embedded teaching through the most-to-least prompting procedure within Orff-based music activities on teaching concepts to children with autism was researched.

Experimental process consisted of baseline sessions, daily probe sessions, teaching sessions, monitoring sessions and generalization sessions. Baseline sessions were carried out 2 days a week, for a period of 1 course hour a day, at the rehabilitation center. All of the stages except for sessions at generalization stage were carried out by the researcher. On the other hand, generalization sessions were conducted by another special education teacher, at another place and with other determined material. Studies were carried out on the basis of one-to-one teaching organization. Response interval was determined as 5 seconds. At teaching sessions, the method of most-to-least prompting was implemented as follows: Full physical prompt for the first 5 sessions, partial physical prompt for the second 5 sessions, and prompt of serving as a model for subsequent sessions. Concerning probe, generalization and maintenance sessions, the teacher sat in front of the participant, as such that the U-shaped table remains between them, where probe equipment is put onto it. During teaching sessions, relevant concept was taught by means of the method most-to-least prompting and as embedded into music activities. On the other hand, probe sessions were planned as individual sessions, independent from teaching sessions. With baseline probe sessions, it was intended to obtain baseline data of the participant prior to the implementation. Probe sessions were organized as one session per day for each of the subjects on planned dates. Within scope of the process, baseline rolls were taken from the first participant and teaching applications were started. When teaching sessions were started with the first participant, baseline sessions were conducted with the second participant. When the first subject met the criterion, teaching sessions of the second subject were started and baseline sessions were conducted with the third participant. Five trials were carried out regarding the concept for which probe was conducted at each probe session. During baseline probe sessions, correct and incorrect responses of the participant were entered into the relevant data form. During the probe, incorrect responses and no responses were ignored, while correct responses were reinforced with constant reinforcement schedule. Daily probe sessions were organized for the purpose of determining performance levels of participants with regard to the concept that is taught during the teaching process. Just like baseline probe sessions, they were conducted as five trials related to the concept which is taught, prior to each teaching session starting from the second teaching session. Potential

participant responses expected at daily probe sessions are the same with participant responses expected at baseline probe sessions. Related to the concept taught to the participant at daily probe sessions with regard to the teaching sessions, teaching was maintained until minimum 80% correct performance is obtained from 3 consecutive sessions. Maintenance sessions were organized on 1st, 2nd and 4th weeks following the teaching sessions. Generalization sessions were carried out for the purpose of measuring generalizability of the relevant concept on the basis of interpersonal, inter-media and inter-material. Maintenance and generalization sessions incorporate the same steps with daily probe sessions.

Analysis of Data

In this research, multiple probe design across subjects was used. Data were analyzed and interpreted with graphical analysis technique. In this research, baseline sessions were involved to identify the level of children about concepts before implementation; training sessions were involved to identify the effect of implementation and maintenance sessions were involved to identify whether or not effect of the implementation continued. During graphical analysis, it was evaluated whether or not the method used in the teaching is effective, through comparison of previous curves with the curves obtained from baseline, training and maintenance stages, which are the steps of multiple design across subjects. In the analysis of baseline, training and maintenance data, linear graphic technique was used among graphical analysis techniques. On the other hand, the data obtained from generalization sessions of the research was analyzed by showing on column chart through pre-test post-test model.

Results

Research data was analyzed in three stages-baseline probe sessions, training sessions and maintenance sessions. Considering the baseline data of the first participant Ege was measured. Ege failed to give correct response to five trials offered to him during each of the sessions, which resulted in a success rate of 0% for three consecutive sessions. As consistency was observed in baseline data, 16 sessions remained below the criterion. Ege met the criterion at 17th session (80%). It was observed that Ege failed to meet the criterion in the subsequent 3 sessions. After 3 sessions, at

21st session, the performance was 80% again, it was 100% at 22nd session, and again 100% at the 23rd session. Training process was concluded after consistency was ensured. Considering the baseline data of the second participant Baran, he failed to give correct response to five trials offered to him during each session and three consecutive sessions yielded a performance of 0%. After consistency was observed for baseline data, 22 training sessions remained below the criterion, Baran managed to meet the criterion at the 23rd session (80%). He showed 100% performance at the 24th and 25th sessions, therefore three sessions met the criterion consistently. Training was terminated after consistency is reached. Concerning the baseline data of the third participant Meram, Meram failed to give correct responses to five trials offered to her during each session, and three consecutive sessions remained at the level of 0%. Following the consistency in baseline data, 15 sessions failed to meet the criterion, and Meram managed to meet the criterion at 16th session (80%). Subsequent 17th and 18th sessions resulted in a performance of 80%, therefore three sessions consistently met the criterion. Training was terminated following the consistency. It is observed that Ege, Baran, and Meram made progress from the first training session to the final training session.

Maintenance data was collected on the 1st, 2nd and 4th weeks following the consistency demonstrated by each of the participants at training sessions. It was observed that all of the participants maintained the same consistency on the 1st, 2nd and 4th weeks, following completion of the teaching

Generalization data Inter-media, interpersonal and inter-materials generalization data of the participants were found at the level of 100% for three consecutive sessions.

Social validity data were obtained for the purpose of identifying the opinions of parents of the participants on objectives of the research, teaching applications used to meet these objectives, and the importance of obtained findings. Following evaluation of the data, parents of the participants stated that they were satisfied with embedded teaching application carried out within music activities, that they found the concept which was taught important for their children, that they wanted subsequent training activities to be organized in the same manner, that their children managed to use relevant concept at other times other than the education process, that they observed progress in their children with regard to the learning ability and speed for learning

similar concepts, that awareness of their children for other colors improved after participation in this study, that their children's communication abilities improved as they discovered music, rhythm and dance, that they mostly appreciated the execution of teaching together with various materials and music activities. It can be concluded that the research has social validity, by considering above answers of participants' parents that they gave in the Social Validity Question Form.

Discussion

Within the research process, answers to following questions were sought: Is embedded teaching through the most-to-least prompting procedure within Orff-based music activities effective for teaching concepts to children with autism?, Is the concept that is taught maintained on the 1st, 2nd and 4th weeks following the teaching process?, Is inter-media, inter-personal and inter-material generalization possible? In addition, social validity level was identified with regard to the research process. Accordingly, an increase was observed compared to the baseline, with regard to the curves obtained for three students participated in the research in the embedded teaching through the most-to-least prompting procedure within Orff-based music activities. These findings demonstrated that embedded teaching through the most-to-least prompting procedure within Orff-based music activities is effective for teaching the color (yellow) concept to children with autism.

It is impossible to make a precise comparison, as there is not any other research which investigates the effects of embedded teaching through the most-to-least prompting procedure within Orff-based music activities on children with autism and which gathers all of these issues in a single study. However, comparisons performed with other research findings on the following subjects are discussed below: concept teaching which completes the research, errorless teaching methods, the method of teaching through most-to-least prompting, embedded teaching method and Orff-Schulwerk music and movement approach.

Studies which were examined with regard to the concept teaching deal with the effect of music education on concept teaching (Avşalak, 2008), effectiveness and productivity of direct teaching and teaching with simultaneous prompting on concept teaching (Çelik, 2007), effectiveness of teaching the color concept with simultaneous prompting

(Birkan, 2002; Toper, 2006), effectiveness of direct teaching method applied with the natural language in the acquisition of long-short, big-small concepts (Ekergil, 2000), effectiveness of natural language and structured language use on teaching the color concept (Kircaali-İftar, Birkan, & Uysal, 1996). It was observed that findings of this research were similar to findings from these other studies thus demonstrating that errorless teaching methods and natural teaching methods are effective for teaching concept.

Studies which are associated with the teaching method of most-to-least prompting among errorless teaching methods deal with the following issues: Effects of teaching through most-to-least prompting on motor behaviors and stereotyped behaviors (Yanardag, 2007), effectiveness in teaching basic tennis abilities to children with autism (Yanardag et al., 2011), effectiveness in teaching the ability of fulfilling the instructions given to children with autism (Canay, 2003), effectiveness in acquisition of chain abilities (Aykut & Varol, 2007), effectiveness in learning of free time skills (Vuran, 2008), effectiveness in teaching of self-care skills (Özen, Acar, Tavlar, & Çetin, 2000). All of these studies demonstrated that this method is effective in the acquisition of determined target skills. All of these findings support the findings which reveal that teaching through most-to-least prompting is effective.

Considering the research results which reveal the effectiveness of embedded teaching, it was concluded that embedded teaching was effective on increasing independence of autistic adults in social activities (Parsons, Reid, & Lattimore, 2009), gaining abilities of preparation to integration (Odluyurt, 2008), teaching chained leisure skills to children with autism (Kurt, 2009), teaching counting skills (Daughtery et al., 2001), teaching the skill to imitate fellows (Venn et al., 1993), and skill acquisition of pre-school children (Grisham-Brown, Schuster, Hemmeter, & Collins, 2000). In all of these studies, embedded teaching has been effective in acquisition of targeted abilities. These findings support results of this research on embedded teaching.

Considering the results of studies which deal with music studies carried out with Orff approach, it is effective on acquisition of number and operation concepts (Bolat & Sığırtaş, 2006), reducing problem behaviors that arise based on repetition (Berrakçay, 2008; Lanovaz et al., 2011), and improving attention abilities, creativity and social communication abilities (Aral et al., 2006; Kuşçu,

2010; Register & Hillard, 2008; Sökezoğlu, 2010; Uysal, 2009). All of these comparisons demonstrate that findings from this research support the findings of previous scientific researches and show similarities with regard to certain aspects.

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